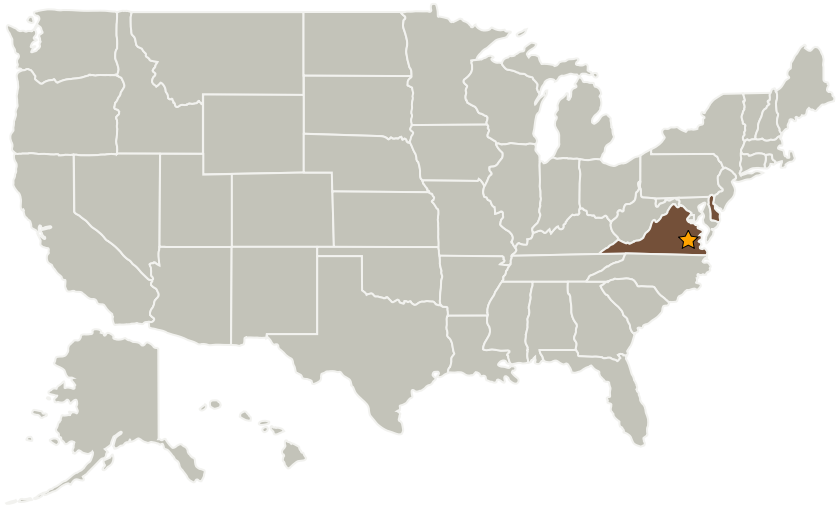
Optimal Composite Materials using NASA Resins or POSS Nanoparticle Modifications for Low Cost Fabrication of Large Composite Aerospace Structures, Phase I

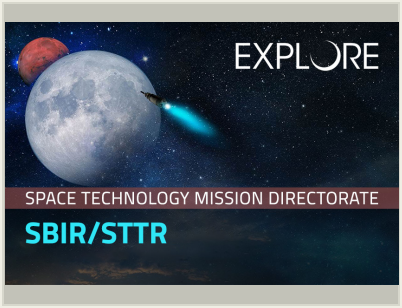
Completed Technology Project (2005 - 2005)

Project Introduction

Reduced mass composite materials are crucial to the success of aerospace systems, but their adoption is inhibited because they require autoclave consolidation, a process that is prohibitively expensive for large aerospace structure. To remedy this, NASA-LaRC has been developing cost-effective high-performance thermoplastic composite processing equipment that enables out-of-autoclave tape placement. In particular, NASA is working with Accudyne Systems to install a heated in situ deposition placement head to fit on NASA-LaRC's placement machine. This SBIR is to create the optimal composite material feedstock to go hand-in-hand with the thermoplastic process equipment so as to create desirable mechanical and physical properties in a part with out-of-autoclave in-situ placement. Accudyne Systems will define the matrix resin and fabricate thermoplastic tape to create the ideal in situ processible material. The first approach will be to proveout a fully amorphous composite based upon NASA 8515. This avoids the undesirable kinetics of a semi-crystalline thermoplastic like PEEK. The second approach will be to use POSS nanoparticles in semi-crystalline PEEK to accelerate crystallinity to the short time scale of the in situ process. The best options will be commercialized to allow NASA and aerospace primes to fabricate low-cost large composite structure for air and space transport.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Accudyne Systems, Inc.	Supporting Organization	Industry	Newark, Delaware

Primary U.S. Work Locations	
Delaware	Virginia

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Mark B Gruber

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.1 Materials

Continued on following page.

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Technology Areas *(cont.)*

- TX12.1.6 Materials for Electrical Power Generation, Energy Storage, Power Distribution and Electrical Machines